

NEW SPECIES AND SUBSPECIES OF *RAPALA* MOORE AND *DEUDORIX* HEWITSON (LEPIDOPTERA: LYCAENIDAE) FROM EAST TIMOR

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Abstract

Rapala aquamarina sp. n., *R. christopheri* sp. n., *R. manea odemo* subsp. n., *R. varuna tacita* subsp. n. and *Deudorix epijarbas timorleste* subsp. n. are described and figured from East Timor. They are compared with related *Rapala* Moore and *Deudorix* Hewitson taxa from the Indo-Pacific region.

Introduction

Rapala Moore and *Deudorix* Hewitson are the two largest Indo-Pacific genera of the lycaenid tribe Deudorixini. The genus *Rapala* contains several dozen species that are essentially Southeast Asian in distribution, weakly extending into the Palearctic and Australian regions. Within the Indo-Pacific region, Corbet and Pendlebury (1978, 1992) recorded 14 species of *Rapala* from Peninsula Malaysia, which were revised by Corbet (1939). Seki *et al.* (1991) listed 12 species from Borneo, while only six species are known from Sulawesi, east of Wallace's Line (Vane-Wright and de Jong 2003). D'Abrera (1971, 1990) listed only *R. varuna* (Horsfield) from the Australian region, but did not list *R. varuna* or any *Deudorix* species from Timor. *Deudorix* is widely distributed in the Afrotropical, Oriental and Australian regions (Braby 2000). To date, no species of either *Rapala* or *Deudorix* is known or has been recorded from Timor. During a recent visit to East Timor by one of us (DL, in conjunction with Mark Lane) in 2004, four *Rapala* and one *Deudorix* species were collected, which are discussed below.

Known species of *Rapala*, as in the related genus *Deudorix*, constitute both 'blue' and 'orange' species. All of the new *Rapala* taxa described here represent 'blue' species, except one, which clearly belongs to a group with several representatives in Sulawesi and western Indonesia. The 'orange' species of *Rapala* were revised by Takanami (1992), who earlier (1989) proposed a number of new synonyms and lectotypes for this group. Takanami (1998) illustrated all known Southeast Asian species of *Rapala*, recognising 28 for the region.

The fauna of East Timor is poorly known, due mainly to extremely limited access over the past thirty years. The recent independence of East Timor has created an opportunity to gain access and observe some of the Lepidoptera fauna there. Many detailed descriptions of Indo-Pacific *Rapala* and *Deudorix* species have been published previously - where appropriate, the following descriptions serve to highlight each species' distinguishing features.

The following collection acronyms have been used: ANIC – Australian National Insect Collection, Canberra; DLC – Private collection of D. A. Lane, Atherton; CJMC – Private collection of C. J. Müller, Sydney.

***Rapala aquamarina* sp. n.**

(Figs 1-4, 19)

Types. Holotype ♂, EAST TIMOR: 5 km NW Bobonaro, 9°00'35"S, 124°17'E, 16.i.2004, D.A. & M.D. Lane (in ANIC). Paratypes. 1 ♂, 1 ♀, same data as holotype, but dated 15, 16.i.2004 (in DLC); 1 ♂, same data as holotype but dated 15.i.2004 (in CJMC).

Description. Male (Figs 1-2). Forewing length 15 mm. Head and eyes brown. Thorax and abdomen aquamarine blue. Forewing upperside broadly black, from basal 1/3 to tornus deep aquamarine blue; sex mark broad, light brown. Hindwing upperside broadly deep aquamarine blue, termen narrowly edged black; linear tail black, white tip; tornal lobe brown, a black central spot with a black outer ring and blue scaling overlay. Forewing underside broadly brown, termen edged darker brown; a faint subterminal band runs parallel to termen; a broad brown submedian band, edged white, extends from costa, directed towards inner tornus but not reaching dorsum; a short brown band transverses end of cell. Hindwing underside broadly brown, dorsum area slightly darker brown; a broad dark brown band, edged white, extends from costa directed towards tornus for 3/4, then angling towards dorsum; white edging in dorsal area more pronounced; tornal lobe black; faint tornal eyespot black, edged white terminally; a faint subterminal brown line extends from near apex to tornal eyespot.

Male genitalia (Fig 19, Genitalia slide ANIC 18572). Genitalic ring oval; sociuncus U-shaped anteriorly in dorsal view, with prominent hump at base of saddle, sociuncus rounded laterally; brachium long, thick but tapering apically, strongly dipping downwards; valvae squat, bifurcated with rounded apices; aedeagus elongate, flattened apically, canoe-shaped with three spine-adorned folds.

Female (Figs. 3-4). Forewing length 15 mm. Head and body pale brown. Wings broader and more rounded than in male; forewing upperside broadly pale blue, termen and apex narrowly black; a very pale brown central area extends from just beyond cell to CuA₂. Hindwing upperside broadly pale blue, tornal lobe and linear tail as in male. Underside as in male, but much paler light brown ground colour.

Etymology. Named after the distinct aquamarine colouration of the male upperside, which contrasts noticeably with the black forewing apex.

Comments. *Rapala aquamarina* is very distinctive, the male with an upperside wing pattern, colouration and forewing sex mark reminiscent of an unrelated Oriental lycaenid, *Tajuria mantra* (C. & R. Felder). In particular, the lustrous, aquamarine colour of the male upperside is unique among

described *Rapala* species. The undersides of both wings bear a broader median band than any other 'blue' *Rapala*, and the distinctive white basal bordering to these bands is also unusual.

The genitalia of *R. aquamarina* show similarities to both *R. varuna* (Horsfield) and *R. manea* (Hewitson), as well as to *R. rhoecus* de Niceville. The sociuncus of all these taxa are very similar when viewed dorsally. The valvae of *R. aquamarina* are more squat, with thicker apices than other 'blue' *Rapala* species examined, and the aedeagus is particularly distinctive, being canoe-shaped apically and possessing three folds bearing numerous regularly spaced spines on their crests.

Rapala christopheri sp. n.

(Figs 5-8, 20)

Types. Holotype ♂, EAST TIMOR: 10 km SW Dili, Mangroves, 22.i.2004, D.A. & M.D. Lane (in ANIC). Paratypes: 1 ♀, same data as holotype (in ANIC); 7 ♂♂, 7 ♀♀, same data as holotype, but 7, 22.i.2004 (in DLC); 4 ♂♂, 4 ♀♀, same data as holotype, but 7, 22.i.2004 (in CJMC).

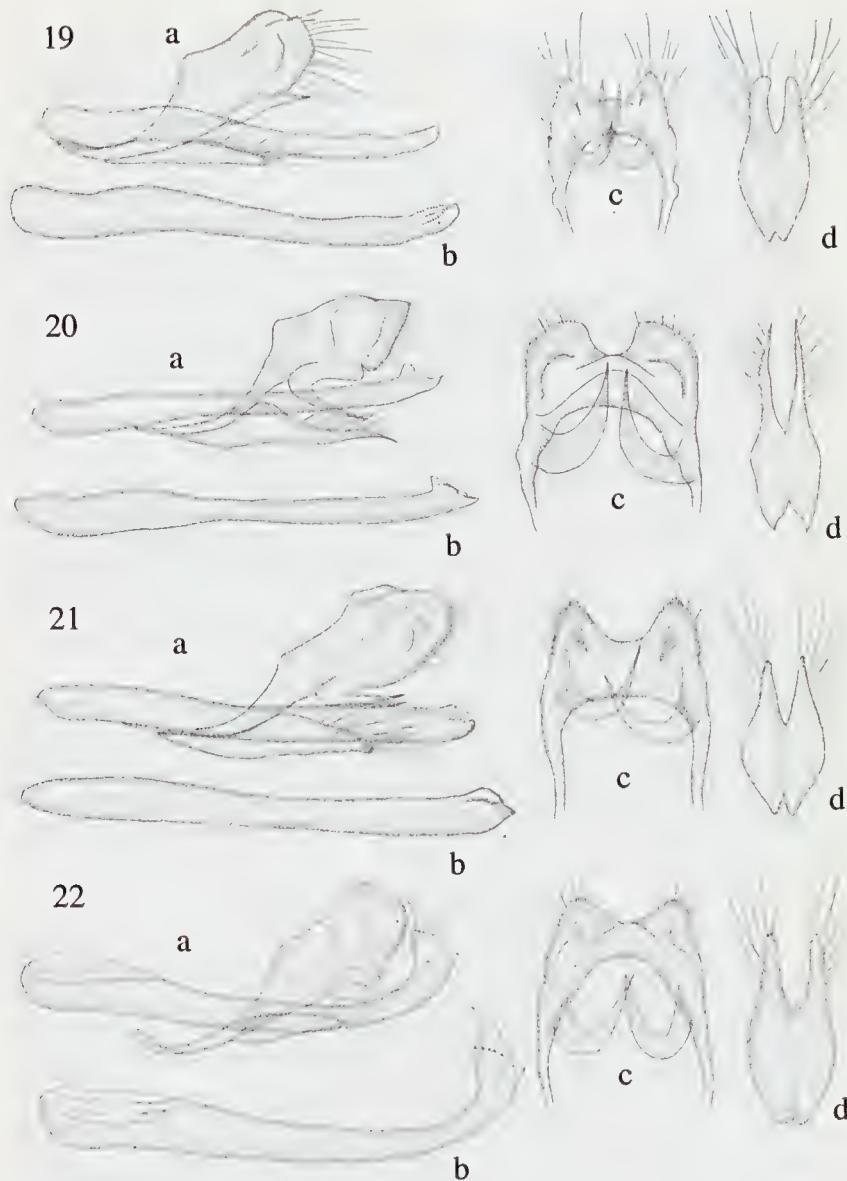
Description. Male (Figs 5-6). Forewing length 14-17 mm. Forewing upperside broadly black extending along costa, termen and dorsum; a broad central area rich orange that extends basally along and below cell, but not reaching termen. Hindwing upperside basally black and extending along dorsum to tornus and costa, but not reaching apex; outer 2/3 broadly rich orange extending to termen; termen thinly edged black; linear tail black, white tip; tornal lobe orange, with black centre, distally edged white; a distinct pale brown sex mark above cell. Forewing underside broadly pale brown, inner central area (mirror image of upperside rich orange) very pale brown; a dark brown postmedian band extends from costa in a broad arc towards, but not reaching, inner tornus; a small brown transverse bar extends across outer cell; a faint brown subterminal band runs parallel to termen. Hindwing underside broadly brown; a brown postmedian band extends from costa, directed for 2/3 towards but not reaching tornus, then angling to dorsum; that section of band meeting dorsum pale yellow brown, edged white; a subterminal brown band extends parallel to termen from apex to eyespot; eyespot centrally black, edged pale orange basally, edged white terminally; dorsal lobe black, edged white terminally.

Male genitalia (Fig 20, Genitalia slide ANIC 18573). Genitalic ring oval; sociuncus U-shaped anteriorly in dorsal view, sociuncus squared laterally, pointed at apex; brachium long, thick but tapering apically, strongly dipping downwards; valvae narrow, bifurcated both posteriorly and anteriorly, with very long, tapered apices; aedeagus elongate, humped anteriorly and with subtle, teeth-like processes at apex.

Female (Figs 7-8). Forewing length 16-18 mm. Wings broader and more rounded than in male. Forewing and hindwing upperside broadly grey-brown,



Figs 1-18. *Rapala* and *Deudorix* spp., upper and undersides. (1-4) *Rapala aquamarina* sp.n.: (1-2) male; (3-4) female. (5-8) *Rapala christopheri* sp.n.: (5-6) male; (7-8) female. (9-12) *Rapala manea odemo* ssp.n.: (9-10) male; (11-12) female. (13-14) *Rapala varuna tacita* ssp.n., male. (15-18) *Deudorix epijarbas timorleste* ssp.n.: (15-16) male; (17-18) female.



Figs 19-22. Male genitalia of *Rapala* spp. (a) Genitalia with left valva removed, lateral view, 20X; (b) aedeagus, lateral view, 22X; (c) sociuncus, dorsal view, 20X; (d) valvae, ventral view, 20X. (19) *R. aquamarina*, genitalia slide ANIC 18572; (20) *R. christopheri*, genitalia slide ANIC 18573; (21) *R. manea odemo*, genitalia slide ANIC 18574; (21) *R. varuna tacita*, genitalia slide ANIC 18575.

noticeably darker along forewing costa and termen, and along upperside veins. Hindwing tornal lobe centrally black, edged pale orange basally, edged white terminally; linear tail black, white tip. Underside as in male, but basal colour paler light brown.

Etymology. Named after Christopher Lane of Townsville, who was coerced to endure many entomological excursions during his school years.

Comments. *Rapala christopheri* is a further 'orange' species, with broad median bands on the underside of the wings in both sexes. Additionally, the white discocellular markings on the underside of both wings and the yellowish submarginal band on the hindwing underside allow separation from other described 'orange' *Rapala* taxa. Both sexes of the Indo-Malayan *R. dienece*s (Hewitson), *R. damona* Swinhoe and *R. iarbus* Fabricius are similar to *R. christopheri* on the upperside, but each are easily distinguished from the latter: *R. dienece*s has an ochraceous yellow-brown underside ground colour (grey-brown in *R. christopheri*) and less pointed forewings in both sexes; both *R. damona* and *R. dienece*s have reduced reddish areas in the upperside of the wings, while *R. iarbus* has more extensive red colouration. However, the most distinctive difference between *R. christopheri* and these species is the much broader underside bands, which on the forewing are also more strongly bowed and displaced basally. *R. christopheri* is the most southeasterly known of the 'orange' *Rapala* species.

The male genitalia of *R. christopheri* are similar in form to other 'orange' *Rapala* species, especially in the strongly bifurcated posterior end of the valvae. The sociuncus of *R. christopheri* is close to that of *R. enipeus* Staudinger, while the valvae are most similar to those of *R. dienece*s. No described species of *Rapala* has such finely tapered valva apices as in *R. christopheri*.

Rapala manea odemo subsp. n.

(Figs 9-12, 21)

Types. Holotype ♂, EAST TIMOR: 5 km NW Bobonaro, 9°00'35"S, 125°17'E, 14.i.2004, D.A. & M.D. Lane (in ANIC). Paratypes. 1 ♀, same data as holotype (in ANIC); 6 ♂♂, 5 ♀♀, same data as holotype, but 14, 16.i.2004; 1 ♂, Bobonaro, 1000 m, 9°00'08"S, 125°19'25"E, 11.i.2004, D.A. & M.D. Lane (all in DLC); 2 ♂♂, 4 ♀♀, same data as holotype, but dated 14, 16, 20.i.2004 (in CJMC).

Description. Male (Figs 9-10). Forewing length 16-17 mm. Forewing upperside broadly dark blue, apex and termen narrowly black; a distinct trident sex mark straddles M_3 , CuA_1 and CuA_2 . Hindwing upperside broadly dark blue, tornal area edged white; tornal lobe black centre, edged white distally, with pale orange patch basally; linear tail black, white tip. When viewed obliquely, the lower forewing (below trident sex mark) and outer 2/3 of hindwing are rich iridescent blue. Forewing underside grey-brown; postmedian band narrow, darker brown, edged white (more distinctly

apically); darker brown transverse band, edged white, across apex of cell. Hindwing underside grey-brown, postmedian and median band darker brown, edged white; where postmedian band meets dorsum it is edged white with iridescent green overlay; a second iridescent green line from dorsum to just above tornal lobe; tornal lobe black, edged white distally; eyespot black, with basal orange brown patch, edged white distally; linear tail black, white tip.

Male genitalia (Fig 21, Genitalia slide ANIC 18574). Genitalic ring oval; tegumen with prominent sharp crown laterally; sociuncus U-shaped anteriorly in dorsal view, with pointed apices, rounded laterally; brachium long, thick but tapering apically, strongly dipping downward; valvae pear-shaped, bifurcated both posteriorly and anteriorly, with long, sharp apices; aedeagus elongate, uniform thickness along entire length, with deep apical suture.

Female (Figs 11-12). Wings broader and more rounded than in male. Forewing length 17 mm. Forewing upperside broadly light blue; apex and termen darker blue-black. Hindwing upperside broadly light blue, termen narrowly edged black; tornal lobe and linear tail as in male. Underside similar to male, but basal colour browner.

Etymology. Named after the district of Odemo, centred on the limestone outcrop areas where this and many other species were encountered.

Comments. *R. manea odemo* is distinctive in having narrower wings than other described subspecies, especially in the male which possesses very pointed forewings. Additionally, the blue upperside is much lighter and more sombre coloured, giving the trident sex mark in the postmedian area of the male forewing a starker contrast. When viewed obliquely, the iridescent sheen is also much less violet than in other subspecies. On the underside the ground colour is dull grey (pearly-grey in most other subspecies) and the white median band on both wings is more contrasting.

The male genitalia of *R. manea odemo* are also distinctive when compared with described subspecies of *R. manea* from Southeast Asia, the valvae being more pear-shaped and acute. The sociuncus apices are more sharply pointed than in other subspecies and the aedeagus is simple, lacking the bulbous anterior end seen in other subspecies examined.

***Rapala varuna tacita* subsp. n.**
(Figs 13-14, 22)

Type. Holotype ♂, EAST TIMOR: Bobonaro 1000 m, 9°00'08"S, 125°19'25"E, 8.i.2004, D.A. & M.D. Lane (in ANIC).

Description. Male (Figs 13-14). Forewing length 16 mm. Forewing upperside broadly rich blue, termen narrowly edged black. A distinct black sex mark patch at end of cell. Hindwing upperside broadly rich blue, termen narrowly edged black; linear tail black, white tip; tornal lobe black, with a basal

orange-brown patch, distally edged white. Forewing underside as in other subspecies, but ground colour paler grey-brown, without any suffusion of darker colour; eyespot black, basally edged orange; tornal lobe black, edged white distally, edged pale orange basally; a pale blue patch lies between tornal lobe and eyespot.

Male genitalia (Fig 22, Genitalia slide ANIC 18575). Genitalic ring oval; tegumen with prominent crown laterally; sociuncus U-shaped anteriorly in dorsal view, rounded laterally; brachium long, thick but tapering apically, strongly dipping downward; valvae bifurcated posteriorly and with long, rounded apices; aedeagus elongate, bulbous posteriorly and with long, 'tongue-like' process at apex.

Female. Unknown.

Etymology. The name *tacita* refers to such a wide-ranging species having been overlooked on the island of Timor for such a long period of time. Translates to being understood, without being stated.

Comments. This subspecies is readily separable from other described subspecies of *R. varuna* by its very light blue ground colour on the upperside of both wings in the male. The sex brand is more restricted and the underside ground colour is a more uniform medium grey-brown than in other subspecies, which are generally darker and suffused with purple.

The male genitalia of this subspecies are similar to those of other *R. varuna* subspecies examined, the aedeagus bearing the distinctive apical tongue, characteristic of this species. The apex of the aedeagus is strongly bent upwards, a character not as pronounced in other subspecies of *R. varuna* examined.

***Deudorix epijarbas timorleste* subsp. n.**
(Figs 15-18)

Types. Holotype ♂, EAST TIMOR: 5 km NW Bobonaro, 9°00'35"S, 125°17'E, 15.i.2004, D.A. & M.D. Lane (in ANIC). Paratypes. 1 ♀, same data as holotype (in ANIC); 2 ♂♂, 2 ♀♀, same data as holotype, but dated 15, 16.i.2004 (in DLC).

Description. Male (Figs 15-16). Forewing length 18 mm. Forewing upperside broadly black along costa, termen and dorsum. Inner central area below cell rich orange red; some orange red areas straddling and below anal vein. Hindwing upperside basally black for 1/3 and extending across to apex; outer 2/3 rich orange red, veins dusted with black scaling; tornal lobe orange, black center, edged black with white fringe distally; a green spot at tornus in upper tornal lobe; linear tail black, white tip. Forewing underside dark brown, postmedian band darker brown, edged white; dark transverse band at end of cell edged white; a faint subterminal dark brown band, faintly edged white terminally. Hindwing underside dark brown; median and postmedian dark brown bands edged white; white edging more pronounced at dorsum; tornal

lobe black, faintly edged white; eyespot black, edged by an outer orange ring; an iridescent light green band above terminal lobe.

Female (Figs 17-18). Wings broader and rounder than in male. Forewing length 18 mm. Forewing upperside broadly dark brown, costa and apex darker brown; a central area for inner 1/3 below cell orange-brown. Hindwing upperside broadly dark brown; a series of orange-brown spots (variable in number and size) extends along termen from tornus; tornal lobe orange-brown, black central spot, edged black with outer white fringe; linear tail black, white tip. Underside as in male; orange ring to eyespot broader than in male.

Etymology. Named from one of the Tetun names for East Timor – Timor Leste, also referred to as Timor Lorosae.

Comments. *D. epitarbas* (Moore) is widely distributed from India and Taiwan, through Indonesia to New Guinea, northeastern Australia and the islands of the southwestern Pacific (Braby 2000). The status of some of these populations is uncertain and a revision of this and related Indo-Pacific species is needed. Compared with described subspecies of *D. epitarbas* from Borneo, Sulawesi, Maluku, New Guinea and Australia, the three collected males of *D. epitarbas timorleste* are a richer orange-red, with reduced areas of red, especially below the forewing anal vein. The three collected females all have a broad central forewing area and hind wing areas of orange-brown, both features infrequently and only faintly indicated in other subspecies.

Discussion

The 'blue' and 'orange' *Rapala* taxa in the Indo-Pacific appear to form two distinctive groups, separable by their external facies and male genitalia. The structure of the sociuncus, valvae and aedeagus emphasise this grouping. In the blue species of *Rapala*, the sociuncus is fairly constant, being strongly U-shaped when viewed dorsally, while it is rounded apically in lateral view. Similarly, the valvae are similar in all species examined and are generally pear-shaped with thickened apices. The anterior end of the aedeagus is highly diagnostic among the blue *Rapala* taxa. In *R. aquamarina* the apex of the aedeagus is flattened laterally and is distinctive in its canoe-shape, bearing folds with multiple spines, unlike other *Rapala* genitalia examined. *R. manea*, *R. varuna* and *R. rhoecus* appear related to *R. aquamarina* but the males of these taxa are all lustrous purple-blue above and the forewing sex mark is trident in form, while that of *R. aquamarina* is a circular patch of differently coloured scales.

Male genitalia of the orange *Rapala* species also reflect a distinct grouping. In these taxa, the valvae are strongly bifurcated, both posteriorly and anteriorly, but the form of the generally long apices is most diagnostic. In particular, these are very fine and tapered in *R. christopheri*. In lateral view, the shape of the sociuncus in Indo-Pacific orange *Rapala* taxa are distinctive

in that the posterior 'face' is very straight, giving a pointed appearance to the sociuncus apex. With the exception of an undescribed orange *Rapala* species from the Moluccas (CJMC), all taxa have strongly U-shaped sociuncus when viewed dorsally. In all orange *Rapala* genitalia examined, the apex of the aedeagus bears variably pronounced teeth, which are bent backwards, and the tip of the aedeagus is more sharply pointed than in blue *Rapala* taxa.

The mangrove habitat of *R. christopheri* is reminiscent of *R. cowani* Corbet from Singapore, Peninsula Malaysia and Borneo. However, *R. cowani* appears more closely related to the Sulawesi endemic *R. ribbei* Rober in its morphological characters. *R. ribbei*, *R. enipeus* Staudinger and *R. dioetas* (Hewitson) were all taken on several occasions by one of us (CM) in intertidal forest bordering mangroves at various localities in Sulawesi.

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